Section 2.0

Category 1 Introduction

BNFL Inc.

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Category 1 Introduction

2.0.1. Category 1 Requirements

During development of the scope and content for this DSF deliverable, it was agreed that BNFL Inc. would submit two categories of information. This section provides the first category of information defined in 98-RU-0329.

> "The first category is information that provides a description of planned DSFs intended at the date of the submittal (adequate scope information). It is recognized that information in this category may be preliminary. As such, the integrated safety management process described above will not be complete for all of the information supplied."
>
> "The first category of information (that necessary for adequate scope) shall include the following:
>
> - Important-to-safety structures, systems, and components that are known or expected shall be described using the level of detail available at the time of submission. The definition of important to safety used for this determination shall be the definition in the Glossary of the governing documents. BNFL shall include sufficient description of system and structure operations to understand the purpose of the safety design features.
> - SSCs which have not yet been classified as to whether they are important to safety, but which the BNFL considers to be reasonably likely to be classified as important to safety, shall be described also.
> - DSFs that are considered likely shall be described. The description shall be based on the existing design development and BNFL experience with similar facilities. The description of DSFs shall be organized in sets associated with each important to safety structure or system, with sufficient descriptive information to describe what their specific purpose is and how they will achieve that purpose.
> - A description of the manner in which the safety features relate to one another for each important-to-safety SSC shall be provided in as much detail as is known."

The purpose of the Category 1 information is to identify the set of ITS SSCs and associated DSFs to allow the DOE to make an early assessment of the BNFL Inc. approach to safety in design.

This introduction presents a description of the processes used to identify SSCs and DSFs, generic DSFs applicable to all SSCs, how reliable performance is achieved for SSCs/DSFs, safety principles of operation and maintenance, and the format used for presentation of the Category 1 Information. Descriptions of the facility and process are given in the overall introduction (section 1.0).

2.0.2. Process Used to Identify SSCs and DSFs

The following definition of Important To Safety is taken from the glossary of DOE/RL-96-0004:

> "Importance to safety. Structures, systems, and components that serve to provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the workers and the public. It encompasses the broad class of facility features addressed (not necessarily explicitly) in the top-level radiological, nuclear, and process safety standards and principles that contribute to the safe operation and protection of workers and the public during all phases and aspects of facility operations (i.e., normal operation as well as accident mitigation)."
>
> "This definition includes not only those structures, systems, and components that perform safety functions and traditionally have been classified as safety class, safety-related, or safety-grade, but also those that place frequent demands on or adversely affect the performance of safety functions if they fail or malfunction, i.e., support systems, subsystems, or components. Thus, these latter structures, systems, and components would be subject to applicable top-level radiological, nuclear, and process safety standards and principles to a degree commensurate with their contribution to risk. In applying this definition, it is recognized that during the early stages of the design effort all significant systems interactions may not be identified and only the traditional interpretation of important to safety, i.e., safety-related may be practical. However, as the design matures and results from risk assessments identify vulnerabilities resulting from non-safety-related equipment, additional structures, systems, and components should be considered for inclusion within this definition."

The scope and content letter, 98-RU-0329, defines Design Safety Features as "those aspects of important-to-safety SSCs that give assurance that the SSC will perform its safety function." It further states that "These measure include design standards and administrative measures to be used to assure availability and reliability of the SSCs relied upon for safety."

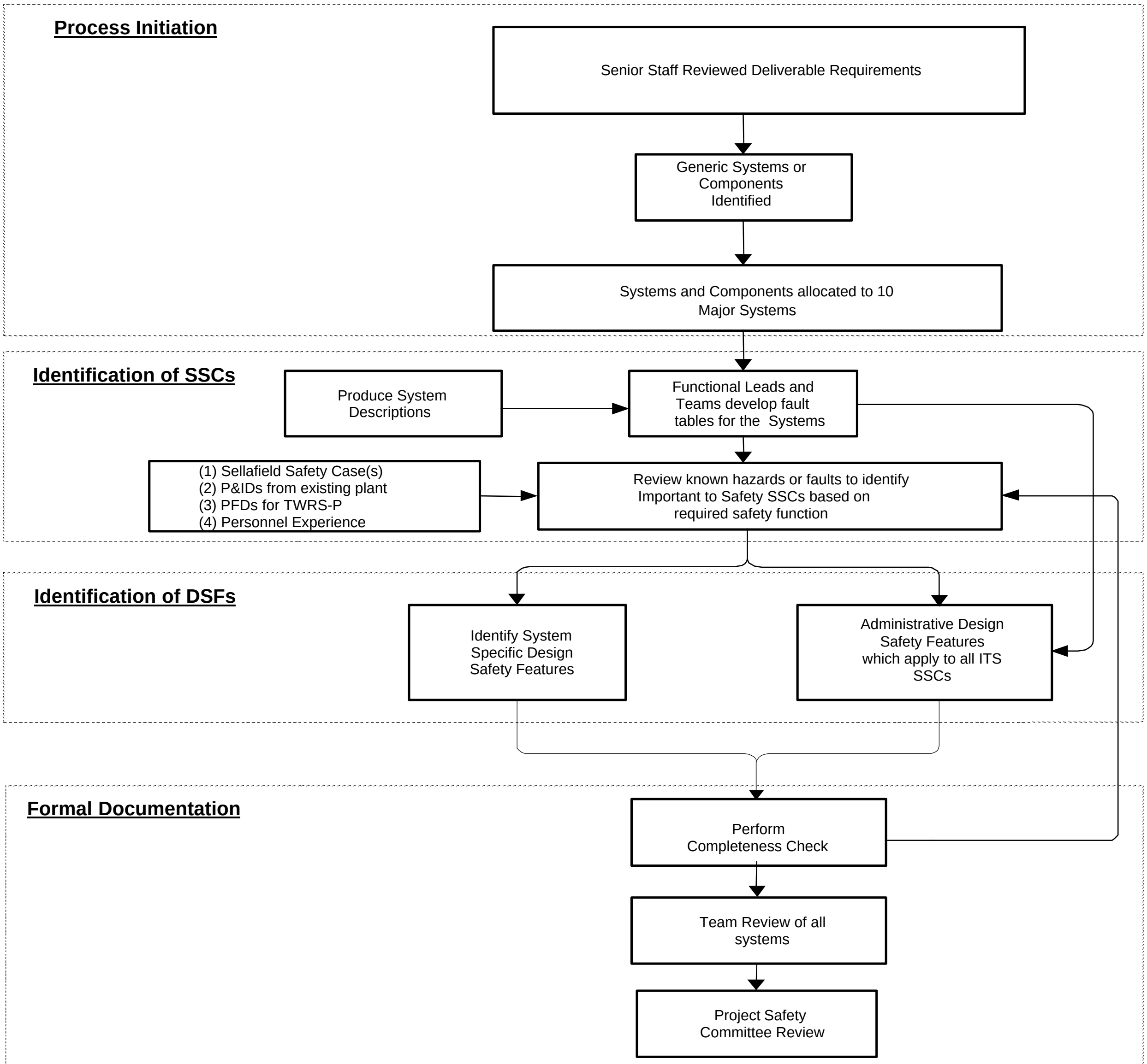
As acknowledged in 98-RU-0329, the status of detailed design and risk assessment in the TWRS-P Project does not currently support a comprehensive listing of ITS SSCs. BNFL Inc. has included those SSCs it considers reasonably likely to be classified as ITS, based upon experience and current specific knowledge of the TWRS-P Facility design. The final selection of ITS SSCs will be done in accordance with the BNFL Inc. Integrated Safety Management Plan and will take account of the results of risk analyses. It will be provided in the PSAR and FSAR.

The overall process used to develop the Category 1 information is shown in Figure 2.0-1.

2.0.2.1. Category I Process Initiation

The identification process was initiated with a review by senior personnel of the requirements associated with the report deliverables and an evaluation methodology was defined. The initial step was to identify the principal generic SSCs expected to be included in the TWRS-P facility based on the Part A work as reflected in the ISAR, HAR, and relevant BNFL experience. These SSCs included generic plant items such as pumps, vessels or cabinets used throughout the facility and specific plant items such as ultrafilters or melters. The list also included service systems such as air and water, and passive systems, such as cell structures. All SSCs listed were initially considered to have the potential to be classified as ITS.

Figure 2.0-1. Development of Category 1 Information



2.0.2.2. Identification of Important to Safety SSCs

Functional engineering leads were assigned for each major system and were responsible for the development of the detailed system information. These generic SSCs were grouped into ten major systems or groups to determine the ITS SSCs and associated Design Safety Features for these systems. Teams of design and safety personnel were selected based on their experience with similar systems on other BNFL Inc. facilities, and TWRS-P Part A work, to identify the ITS SSCs and associated DSFs. Table 2.0-1 provides a list of the major systems, typical generic SSCs, and assigned functional leads .

Table 2.0-1. Grouping of Systems and Typical Generic SSCs

Major Systems	Functional Lead	TYPICAL Generic SSCs
1. Shielding and Confinement	Brian Davies	Cell structures, vessels, piping and gloveboxes
2. Ventilation Systems	Peter Shea	Fans, ducts, dampers and filters
3. Electrical Systems	Steve Anderson	Transformers, switchgear and wiring
4. Instruments and Control Systems	Steve Anderson	Sensors, alarms and controls
5. Utilities and Services	Mike Page	Cooling water systems and cold chemical feed system
6. Transfer Devices	John Richardson	Steam ejectors, breakpots and reverse flow diverters
7. Mechanical Systems	Dave Steele	Cave cranes, bottom entry flasks and power manipulators
8. Unit Operations	Dave Vickers	Evaporators, HLW melters, and ion exchange columns
9. Fire Protection	Alan Hosler	Effectiveness of fire protection systems and barriers
10. Other Events	Alan Hosler	DSFs in SSCs numbers 1 & 2

The known faults and hazardous situations were considered for each of the systems. The SSCs that prevent or mitigate the fault or hazard were considered ITS SSCs. The safety function required to provide protection against these faults and hazardous situations, and the design features necessary to ensure the safety function, were identified for the ITS SSCs.

The hazard identification included consideration of internal/common cause hazards, natural phenomenon hazards, normal operational (i.e., non-fault) hazards, and criticality. A number of steps were taken to ensure that the listing of ITS SSCs was as complete as possible:

- The ISAR was reviewed to ensure that all hazardous situations identified there, and that all the ITS SSCs listed in it, were addressed.

- The HAR was reviewed to ensure that all the hazards identified there, and that the implied ITS SSCs (safeguards), were addressed.

- The Category 2 information (section 3 of this deliverable) was reviewed to ensure the ITS SSCs and their DSFs were addressed (See Table 2.0-2).

- A high level screen using the HAZOP guide words was used to check for any missing major hazards.

- A HAZOP review of the changes from Part A to current baseline design was conducted to identify any additional ITS SSCs.

Table 2.0-2. Category 2 SSC Locations in Category 1.

Category 2 Example	Category 1 SSC Groups									
	1	2	3	4	5	6	7	8	9	10
1. Hydrogen Generation in the High Level Waste Storage Vessels	X	X	X							
2. Loss of Cooling to the Cesium Storage Vessel	X		X	X	X					
3. Load Drop of a Pretreatment Pump (Out of Cell)	X				X		X			
4. HLW Melter Feed Line Failure	X	X					X			
5. Cooling Water Contamination				X	X					
6. Sample Carrier Breakout				X	X					
7. Low Activity Waste Pipe Break	X			X						
8. Receipt Vessel Rupture	X	X								
9. Activity Backflow from a Process Vessel into the Vessel Wash Cabinet	X									
10. Nitric Acid Handling	X		X		X					

This fundamental analytical process was iterated several times to make sure the results identified any additional SSCs and/or DSFs resulting from full consideration of generic DSFs, preoperational checking activities, work control, human factors considerations, likely emergency procedure requirements, and eventual decommissioning.

Typical examples of Sellafield plants that contain systems comparable to those envisioned for TWRS-P are shown in Table 2.0-3.

Table 2.0-3. Comparable Sellafield Systems and Plants.

Function	Systems	Sellafield Plant
Shielding and Confinement	Cells, Caves, Vessels, Piping	All Plants
Ventilation Systems	Fans	All Plants
	Filters	
	Control room ventilation	
Electrical Systems	Standby Generators, UPS	All Plants
Instruments and Control Systems	Automated control systems Instrumentation	All Plants

Table 2.0-3. Comparable Sellafield Systems and Plants.

Function	Systems	Sellafield Plant
Utilities and Services	Steam	All Plants
	Cold chemicals	
	Water	
	Cooling water	
	Compressed air	
Transfer Devices	Steam ejectors	All Plants
	Mechanical pumps	
	Fluidic pumps	
Mechanical Systems	Cave cranes	Vitrification Lines
	Flasking operations	
Unit Operations	Ion exchange	SIXEP
	Evaporation	THORP and Others
	Ultrafiltration	EARP
	Offgas clean up	WVP lines
Fire Protection	Fire Protection System	All Plants (U.S. Standards)
Other Events	Building Structures	All Plants (U.S. Standards)

2.0.2.3. Identification of Design Safety Features

During the normal design process, BNFL selects a set of DSFs commensurate with the severity level and initiation frequency of the fault event. For this deliverable, the team held meetings to review candidate DSFs based upon industry practice and BNFL experience at other facilities. Where engineering judgment indicates the fault event may have relatively severe consequences, passive, engineered DSFs are usually indicated. Active DSFs are less desirable than passive DSFs but are more desirable than administrative controls. In accordance with the 98-RU-0329 Scope and content letter, the intent is to describe design features, not consequences or risk analysis.

In producing a list of generic design safety features for the TWRS-P Facility, BNFL Inc. has adopted an approach which is conservative and credible. This means that for any specific ITS SSC identified, the designers have considered the range of DSFs that have in their experience been applied to such SSCs in modern facilities. The DSFs for TWRS-P are then recorded as the most conservative in that range. DSFs more conservative than the range used in other modern facilities have not been proposed. The ultimate selection of appropriate DSFs will be based on consequence and frequency of events.

An example can be given related to steam ejectors. A known fault condition of steam ejectors is known as “snoring”. In this condition, the ejector either fails to “strike, (i.e., to lift and transfer process liquid) or it continues to run after the process fluid supply has been exhausted. In either case, there is a challenge to the vessel ventilation system through steam, or steam plus process liquor aerosol, being injected. In the ultimate this has the potential to challenge the HEPA filters.

The main protection against “snoring” is the detection of elevated temperatures in the breakpots through which the steam must pass to reach the vessel ventilation system. This safety function that needs to be achieved is that, on detection of elevated temperatures, the steam to the ejectors feeding the breakpot is isolated.

In terms of design safety features applied to the ITS SSCs there are a range of options for achieving this functionality with an appropriate reliability. The temperature detection could be single, duplicated, or diverse. It could be fail safe in its action. The initiation of isolation could be procedural (by alarm to operators), or automatic via software or hardwired systems, or both. The valves effecting the isolation could similarly be single or duplicated, could have diverse operating modes (air versus electric), and could be fail safe. Power supplies to the whole system, or aspects of it, could range from single feed to battery backed non-interruptible.

In the experience of the designers the magnitude of the risk posed by ejector “snoring” has, in previous facilities, justified a single detection element, fail safe, operating a single isolation valve, also fail safe. Alarm back-up is provided to alert operators to the condition. These provisions have allowed safety cases to be made with adequate margins of safety. This represents the tailored DSF set which has been indicated for TWRS-P Facility. The margin of safety provided will be greater in the TWRS-P case, since the material at risk has much lower consequences per unit released than for many of BNFL UK facilities.

A further example is the selection of the appropriate cabinet design to afford protection against back migration of activity through service connections. This might range from full alpha glovebox standards, shielded if necessary, to simple ventilated enclosures with opening doors, according to the activity of the liquors in the connected vessels. In this instance the designers have not at this stage proposed an appropriated designation for each application within the TWRS-P Facility. Selection must await consequences and frequency estimation for specific cabinets and their connected vessels.

Within the process, there are areas where operating practices from Sellafield can contribute but cannot be directly applied to the design. These include the use of Joule Ceramic heated melters, some of the offgas treatment components (e.g., SCRs, HEMEs), and Melter in-cell blending systems utilizing glass formers. However, in these cases, knowledge and expertise was and will continue to be sought from the members of the TWRS-P project team.

2.0.2.4. Final Documentation

The information generated from the process of system identification, and selection and description of ITS SSCs and associated DSFs was compiled into tables. Report descriptions were drafted to fully describe the initial results for review by the team members before submittal to the Project Safety Committee.

2.0.2.5. Interrelationship of Safety Features

The manner in which safety features relate to ITS SSCs is twofold. First, the safety features for a group of SSCs designed to prevent or mitigate a hazard inter-relate by either controlling different aspects of the hazard and/or by providing defense in depth for the hazard. Second, safety features for SSCs that control a type of hazard inter-relate by the need to draw on common services or provide similar safety functions.

The first type of relationship is shown in the tables developed for each of the groups in Category 1 Information. The tables organize the Category I information by hazards (faults), with a list of ITS SSCs, the safety function performed by the SSC, along with their DSFs, that are required to address that hazard. The safety function describes the interrelationship among a group of SSCs that prevent or mitigate a hazard.

For SSCs that require common services, the service is sized to supply all users at maximum capacity. To allow specification of service equipment, the estimate of the maximum capacity are made through out the life of the design. This sizing would be finalized with completion of the HAZOP approved Piping and Instrument Diagrams (P&IDs).

For SSCs that provide a common safety function, the SSCs are designed to meet a consistent set of performance requirements. The identification of these performance requirements is identified in project specifications throughout the life of the project. During design and construction, the final specification of these requirements is in the releasing of procurement specification to vendors. The performance of the SSC is validated in the start up testing for the facility.

The TWRS-P project is currently working the finalization of the PFDs following optimization studies and is preparing to start the initial Piping and Instrument Diagrams (P&ID). Though preliminary estimates of the second group inter-relations (e.g., number of fans, pumps, etc.) were made, finalization will occur in later stages of design.

2.0.2.6. Defense in Depth

The BNFL, Inc. approach to defense in depth is embodied by the Implementing Standard for Defense in Depth in Appendix B to Volume II of the Safety Requirements Document (BNFL-5193-SRD-01, Rev. 2). The principal features of this approach are summarized below.

The design of the TWRS-P process should reduce or eliminate the inherent hazards to the extent possible consistent with achieving the mission of the facility. (SRD Vol. II, Appendix B, Section 2.1.2)

The TWRS-P design should incorporate SSCs that are simple to operate and maintain and resistant to degradation. (SRD Vol. II, Appendix B, Section 2.1.2)

The TWRS-P project will be staffed by well-trained personnel committed to a strong safety culture. (SRD Vol. II, Appendix B, Section 2.1.2)

The TWRS-P design will generally provide multiple physical barriers to confine radioactive material and thereby prevent uncontrolled releases. (SRD Vol. II, Appendix B, Section 2.1.4)

The TWRS-P design will incorporate controls to reduce the probability of hazardous situations (SRD Vol. II, Appendix B, Section 2.2)

The TWRS-P design will incorporate features to control process variables to values within safe conditions, to alert operating personnel to an approach to ward process limits, to allow timely detection of failure or malfunction of critical equipment, and to allow for the imposition of administrative controls. (SRD Vol. II, Appendix B, Section 2.1.3)

The TWRS-P design will incorporate automatic systems to initiate and control protective actions unless it is demonstrated that credit for operator action is permissible. (SRD Vol. II, Appendix B, Section 2.1.5)

TWRS-P will address human aspects that affect safety as follows (SRD Vol. II, Appendix B, Section 2.1.6):

- By designing for human factors
- By implementation of a quality assurance program consistent with 10 CFR 830.120 throughout the life of the project
- By implementing administrative controls identified in the hazard and/or accident analyses
- Through internal safety reviews consistent with SRD Safety Criterion 7.1-3
- By developing Operating Limits (Technical Safety Requirements) consistent with SRD Safety Criterion 9.2-1
- Through the commitments to worker qualification and training in SRD Section 7.2
- Through establishment of a safety/quality program

The Implementing Standard requires that application of these features shall be tailored to the work and associated hazards.

The approach adopted for the generation of the Category 1 deliverable is based largely on provisions made at existing BNFL facilities. The principles of defense in depth have been applied to the design and operation of these facilities and is inherent in the Category 1 SSC and DSF lists.

2.0.3. Administrative Measures

This section covers two specific issues. First it outlines the generic set of administrative design features that all Important to Safety (ITS) Systems, structures and components (SSC's) possess so that they will perform their function when called upon to do so. This covers features from initial design all the way through to active operation. These generic features outlined below will therefore not be repeated in the system specific tables.

Second this section will also outline the principles of how the plant will be operated. This will put into context how all the detailed system specific ITS SSC's identified in the tables will be controlled during operations. Measures are outlined to ensure that the ITS SSC's are operated and maintained by a trained and suitably qualified workforce according to structured operating procedures. Arrangements for radiological classification of areas are outlined as well as emergency preparedness. Finally decommissioning arrangements for ITS SSC's are outlined.

In keeping with the rest of Category 1 information, this section on administrative measures depends very heavily on BNFL engineering and operational experience. It represents a synopsis of the type and depth of measures that BNFL will implement in the TWRS-P facility.

2.0.3.1. Generic Administrative Design Safety Features

All important to safety (ITS) system, structures and components (SSC's) identified in the TWRS-P facility will share a common set of design safety features in addition to any specific design safety features (DSF's) that may be associated with individual SSC's.

These generic DSF's can be broadly described as:

- Measures to ensure that the design of ITS SSC's is correct and that the appropriate standard is applied.
- Measures to ensure that the Procurement/Fabrication of ITS SSC's are properly controlled to the defined standards
- Measures to ensure the correct installation of ITS SSCs
- Measures to test that the installed SSCs perform their specified safety functions before introduction of active challenge.
- Measures to ensure that SSCs continue to perform reliably throughout their operating life.

Each one of these above categories are described in more detail below.

2.0.3.1.1. Design of ITS SSCs

Project engineering procedures assure that the design is accomplished through a process, which uses sound engineering and scientific principles and appropriate standards. High quality work products are achieved through well-proven and established techniques. Appropriate QA requirements are applied through the design process for ITS SSCs. QA reviews are performed of selected design documents to ensure that appropriate quality requirements, inspection requirements and quality criteria are adequately specified. QA reviews encompass the fundamental design processes, including computer software control, design inputs, design interfaces, design output, design checking, design verification, design changes, configuration control and management of records.

In TWRS-P, all of the above activities will be controlled in the QAP. The design process will identify the materials of construction required for each ITS SSC to ensure its operation over its design life in its environment.

The design measures taken are recorded within Design Justification Reports (DJR). These are a series of documents that provide a record of decisions and evidence that the ITS SSC's achieve their safety function. The reports show this by demonstrating that:

- The safety functions ITS SSC's must perform are identified and defined.
- The required design safety features of ITS SSC meet the requirements of the safety function.
- The selected design standards and requirements have been implemented.
- Additional operational measures that are necessary to fulfill the design safety features requirements not provided by engineering are identified.

The Design Justification Report provides part of the auditable set of documents that support the Safety Analysis Report submissions. These documents are subject to multi –discipline design team review.

2.0.3.1.2. Procurement and Fabrication of ITS SSCs

Technical requirements are specified and controlled in procurement documents by project engineering. Design criteria are imposed for the purchase of ITS SSCs. Potential bidders may be required to undergo early review and acceptance of their quality plans in advance of bid request receipt and this review/acceptance will occur prior to contract award. Suppliers are usually qualified based on past performance for similar items/services, demonstrated capability, and onsite audits and surveillance. This provides additional assurance that ITS equipment and services meet the specified project requirements and perform as specified.

Once the contract is placed, audits of suppliers and subcontractors are conducted by appropriately experienced quality personnel based on the complexity and importance of an item or service. Procurement documents may identify required witness or inspection points for the purchaser. Engineering personnel may participate in this effort, especially through periodic process reviews and through witnessing required testing at the fabrication/manufacturing facility. Testing of active ITS SSCs is required as early as possible to eliminate time pressures if corrective actions are required. If durability is not clear from the design and standards used, then a cycle test may be called for.

Materials and consumables used for the fabrication will conform to specification and will be identifiable with its origin. Where appropriate, full chemical and mechanical test shall be conducted. When a passive feature can be tested at a contractors's facility, it will be, e.g., load test of lifting features.

Procurement documents reflect the engineering requirements, the purchaser's experience, supplier recommendations and warranty requirements. Identification of packaging, shipping and storage requirements aimed at providing the maximum physical protection against damage for the purchased items from the point of shipment to the eventual point of installation are identified. Periodic QA surveillance confirms compliance with the requirements.

The quality of procured ITS items is eventually determined by an appropriate combination of reviewing manufacturing process controls, shop inspections, source verifications, receipt inspections, pre and post installation tests, and vendor provided certificates of conformance.

Fundamental to the Procurement / Fabrication stage is management of records in the QA system.

2.0.3.1.3. Installation of ITS SSCs

Construction activities for the installation of ITS SSCs are routinely inspected by quality control inspectors using project developed inspection plans. Installation procedures generally identify hold points where quality control inspection is required. These plans generally identify the attributes to be inspected, the applicable installation procedures, the inspection method or procedure to be used, and the acceptance criteria. Quality assurance personnel conduct surveillance of the inspection program implementation and effectiveness. Deficiencies are documented as non-conformances and are trended for identification of generic problems and as evidence of the effectiveness of corrective actions. All the above practices are conducted with the objective of assuring that the installed ITS SSCs will satisfactorily pass the required start-up tests and thus will perform their intended safety functions if and when called upon during active operation. In addition to these formal measures, every opportunity is taken to inform the construction contractors of the function and purpose of equipment and ITS SSCs. This is done to allow everybody involved to take part in the quality process.

Materials and consumables used for the installation and construction will conform to specifications and will be identifiable with its origin. Where appropriate, full chemical and mechanical tests shall be conducted.

2.0.3.1.4. Testing of ITS SSCs

There are two main aspects covered in the testing of ITS SSC equipment in start-up:

- Testing required to demonstrate that the ITS SSC's will perform their function when called upon to do so in active operation

- Arrangements to ensure that the safety function of ITS SSC's is not compromised by modifications required to allow start-up tests to be undertaken.

The following activities are associated with the testing of ITS SSCs

i) Preparation of start up test schedules:

Start-up tests are identified to test all of the design safety features associated with ITS SSCs. These schedules will define success criteria that must be achieved for each SSC. Dependant of the type of SSC, start-up tests will be required at each level of start-up from water testing all the way through to active testing. These safety tests are outlined in a schedule, which will go through an approval process to ensure that the testing outlined is thorough enough.

ii) Control of conduct of testing and recording of results.

Testwork is carried out in accordance with the approved schedules as outlined above by suitably qualified personnel. QA arrangements will be in place to ensure that test equipment is correctly specified and calibrated for use. Results of tests are recorded on pre-prepared worksheets, raw data records are also kept with the worksheets. Programs for testing ITS SSCs are integrated to manage the interfaces between different start-up activities. However, the formal safety testing of ITS SSCs can only take place when all other cold and process testing is complete for a particular system. This is done to ensure that any temporary measures are at an absolute minimum. These tests will also form the basis for the in-service proof tests at a later date.

iii) Control of faults, defects, and non-compliance recording and remediation.

As start-up progresses faults may be found with ITS SSCs and also that test success criteria may not be met. To control this, records are kept of faults, defects, and non-compliance with success criteria. In each case remedial actions are identified and retesting is defined.

iv) Scrutiny and Approval of Test Packages.

Completed test worksheets are reviewed to confirm that the testwork success criteria have been met. For ITS SSCs, an appropriate management safety committee will scrutinize the testwork package and if satisfied will give final approval prior to SSCs use in active operation. Where necessary, when the management committee are not satisfied that the success criteria has been met, remedial action and retesting will be defined.

2.0.3.1.5. Control of Modifications During Start-up

To enable cold start-up of the TWRS-P facility, some safety systems required for normal active operation will either have to be operated differently or in some cases be taken off line.

Table 2.0-4 shows the types of activities that will be required during cold start-up for which management control is required to ensure that safety is not compromised when the facility goes into active operation.

Table 2.0-4 Activities Required During Cold Start-up

Activity	Description	Control Measure
Over-riding of interlocks/trips and sequences.	During cold start-up, interlocks trips and sequences will need to be over-ridden for a variety of reasons. E.g., Testing of individual components. Trip logic not applying during cold start-up.	Changes to safety systems will be under strict managerial control. This will include a register of all hardwired temporary changes. Functional testing will be carried out prior to the safety system being used in active operation.
Access into Cells/Caves	Access into cells/caves will be required during cold start-up.	Prior to active operation a check of any passive safety systems in cell/cave will be checked. Prior to final closing of cell doors checks will be made to ensure that all temporary equipment has been removed and that all in-cell equipment is in place. Cell/cave closure will then be made to achieve design specification for shielding.
Temporary Modifications	During hot start-up it may be necessary to make temporary modifications to the facility. E.g., Installation of temporary plug in a drain to test the level instruments or in-line flow.	Any such modifications will be carried out under strict managerial control. It will be confirmed that all such modifications are removed prior to active operation. Functional testing of ITS SSCs will be carried out to confirm safety function prior to bringing back on line.
Effluent/Waste Routes	During cold start-up it may be not be appropriate to send inactive effluent/waste along the same route as intended for active operation.	Either engineered routes will be provided in the design, which will then be made physically in -operable prior to active operation, or temporary modifications as described above will be made to allow re-direction of effluent/waste. In each case it will be confirmed prior to active operation that the normal routes for active operation are re-instated.

2.0.3.1.6. Maintaining ITS SSCs During Operations

All Structures, Systems and Components (SSCs) having safety functions essential to meet risk guidelines in the Authorization basis are designated Important to Safety Equipment (ITS). Normal operations, which include anticipated operational occurrences and maintenance and testing activities, shall be controlled so that facility and system parameters remain within their specified operating ranges and that the frequency of demands placed on the ITS equipment for hazard prevention is small.

Reliability is achieved largely through the identification and application of engineering standards that are used to design, construct, test, maintain and operate the specific SSCs that comprise the hazard control strategy.

The control strategy adopted will provide either, both or all of the following:

- Passive and/or active SSCs that function to prevent the release (reducing the probability of the event occurring)

- Passive and/or active SSCs that function to mitigate the release (reducing the consequences of the event)

- Administrative controls.

The facility will be operated and maintained in accordance with the authorization basis, bounded by the Technical Safety Requirements.

This subsection presents a generalized discussion of the administrative controls of Important to Safety (ITS) equipment. The information is based on accepted practice at BNFLs facility at Sellafield in the UK.

As the design matures maintenance and testing requirements will be defined, demonstrating clear compliance with the requirements of the authorization basis.

<u>Operations</u>

The maintenance program for the demonstration ITS equipment functionality will be managed using a Plant Maintenance Schedule (PMS).

The PMS holds the schedule of all safety systems, identified within the authorization basis. The PMS defines the periodicity on which the functionality of ITS equipment must be proven. This time interval for proof testing is based on equipment reliability data and experienced engineering judgement. This time interval can be anything from weekly to annually.

The PMS also lists the source documents from which proof test periodicity's were derived.

<u>Proof Tests</u>

The engineering department on behalf of the Facility Manager prepares proof test instructions that will prove the safety functionality of ITS equipment within its system.

The proof test details:

- Plant status requirements prior to taking the ITS equipment out of service. This may include shut down of the facility, operation on substitute feed or maintaining operations using substitute-monitoring systems according to pre-defined arrangements to ensure that the safety function is not compromised whilst the ITS equipment is out of service.

- Detailed step by step testing requirements, including the expected response or readings from the system. This ensures the person carrying out the proof test can determine the functionality is correct.

- Test completion and return of ITS equipment to service.

All proof tests are prompted from the Maintenance Management System (MMS)

The computerized Maintenance Management System provides:

- A schedule, displayed or printed, of the safety Systems, associated documentation and the Proof Test requirements. It also provides a record of all work carried out on each safety system.

- A mechanism for controlling and archiving changes to the Plant Maintenance Schedule including the electronic retention of superseded PMSs.

- The necessary reports for the management and review of Plant Maintenance Schedule information.

<u>Carrying out Proof Testing</u>

- Proof Test Scheduled

The MMS system schedules an ITS equipment proof test completion date requirement. The time period between ITS equipment proof test may be reduced at the discretion of the plant operator to meet plant production scheduling. The time period between proof tests can only be extended following a plant change procedure.

- Handover of ITS Equipment

Prior to the removal of ITS equipment from plant service authorization in writing is obtained from a suitably Qualified and Experienced Person (SQEP) from the Plant Operations Group (Usually the Shift Manager or Operations Manager) i.e. the plant owner.

It is the Plant Operators (SQEP) responsibility to ensure that the plant is in a suitable condition for the proof test to be carried out i.e. compliance with the Plant Safety Case is maintained.

The plant status requirements for operating without ITS equipment are defined within the Technical Safety Requirements (TSRs).

- Proof test execution

Once approval has been obtained by plant operations, the proof test is carried out by a SQEP engineer under a Safe System of Work (SSOW).

The SSOW details the necessary precautions that are to be taken in carrying out the proof test (this may include physical equipment isolations)

The SQEP engineer completes all the required steps on the proof test, recording all required test data.

- Return to service

Following the successful completion of the proof test ITS equipment is formally handed back to the Plant Operator. The Plant Operator reviews the proof test results and if acceptable returns the ITS equipment back to service.

If during the proof test the ITS equipment does not meet the test requirements then the SQEP plant operator is informed.

The SQEP plant operator investigates the failure and if necessary raises an off–normal or an unusual occurrence report, categorizing the impact to safety. Plant Management and the plant regulator are informed of the occurrences. All events are investigated.

The failed ITS equipment is not returned to service until it is repaired and successfully completed its proof test. Until such a point the plant status remains the same on handover to the SQEP engineer.

- Records

All ITS equipment proof test results are recorded on the MMS system. These records demonstrate compliance with requirements of the PMS and hence the Plant Safety Case.

Return to service of ITS Equipment following maintenance activities

If there is a requirement to carryout maintenance activities outside the normal scheduled proof test regime, the conditions described previously apply.

- Formal handover of ITS Equipment completed
- Maintenance activities completed
- Proof test executed
- Returned to service following successful proof test

It must be noted that credit is taken for completion of the proof test in the schedule and the clock returns to zero.

Breakdown Maintenance

ITS SSC equipment are designed to indicate failure, typically by a trouble alarm or fail safe feature. This is backed up by routine surveillance by operators and routine checks by a plant manager against key safety equipment.

If an ITS SSC is revealed to have failed, then the responsible person will identify what immediate action is required to maintain the required safety function. This will be pre-defined in instructions and would typically be:

- Carry on operations using pre-defined substitution arrangement utilizing other equipment under increased surveillance.

- Stop feeding active material.

- Immediately stop operations.

An event report to prompt a follow up investigation may be required to ensure that failure is properly investigated.

The equipment will then be formally handed over to a SQEP engineer. An appropriate Safety System of Work will be used to investigate/repair the ITS SSC.

Each non passive ITS SSC will have a maintenance instruction. This instruction will clearly note that the equipment is important to safety. All components of the SSC will be clearly labeled as such on the plant.

Maintenance/ repair will be carried out. A functional test of the SSC will be performed prior to bringing it back on line. Only after it has been confirmed that the required safety features have been restored will the equipment be put back into operation.

Records are kept of all maintenance using the Maintenance Management System for all ITS SSC's. In this way reliability data can be generated for management action.

2.0.3.2. Administrative Measures for Plant Operation

This section outlines how we control administrative measures. For TWRS-P, the administrative measures will be put in place according to the Integrated Safety Management Plan.

This subsection reflects best practice used at the Sellafield site and covers control of written procedures, organization and training of operators and makes reference to the control of Important to Safety SSC's as already outlined in the section on generic design safety features. It represents the type and depth of measures that will be put into place in the TWRS-P facility.

There is considerable use of UK terminology in this subsection. It is illustrative only and is presented that way to enable the reader to understand the documents referenced by this section.

2.0.3.2.1. Procedural Requirements

The administrative measures for operating the facility will be put in place using a Quality Assurance System. This ensures that arrangements are in place to ensure that we comply with all legal requirements of operating the facility. This covers:

- All aspects of operation for a nuclear facility. In the U.K this is achieved by compliance with a Site License issued by The Nuclear Inspectorate (NII). This includes the requirement to have an Operating Safety Case.

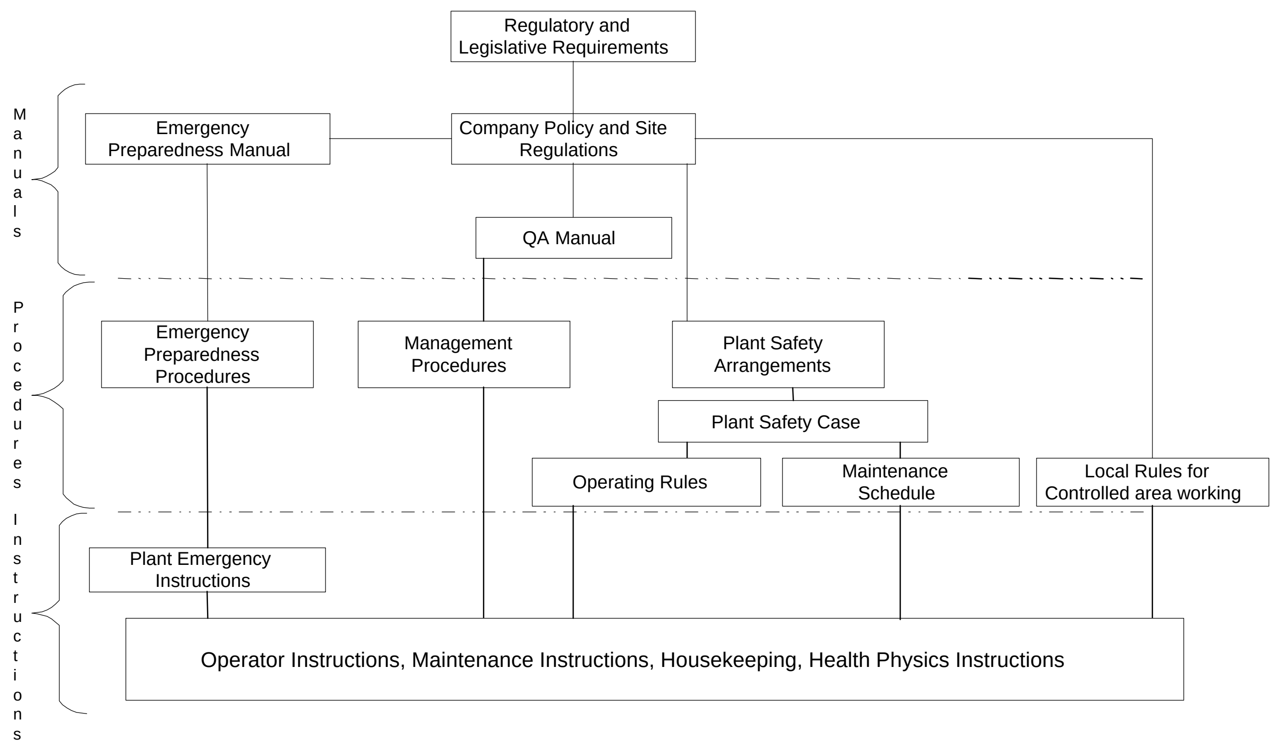
- Industrial Safety

- Environmental Protection

The QA hierarchical system ensures and demonstrates that legal requirements cascade down from regulations through procedures to the detailed instructions used by operators on the facility. An example of this hierarchical approach is shown in Figure 2.0-2.

In this way it is clear how the diverse arrangements to operate and maintain the facility fit together to achieve the declared safety requirements.

Figure 2.0-2. Example of QA Hierarchical System



Operating Safety Case

Through formal safety assessment, hazards are identified and through analysis of hazards the following are identifed;

- Important to Safety Equipment. At BNFL U.K. facilities these are further categorized as:
  - Safety Mechanisms – A device that if not present would mean that the required safety criteria for a given hazard would not be achieved.
  - Safety Related Equipment- Other safety devises that provide defense in depth protection against the identified hazard.
- Safety limits and conditions required to prevent an identified hazard occurring. At BNFL U.K. facilities these are classed as “Operating Rules".
- Instructions/procedures required to comply with these “Operating Rules. At BNFL U.K. facilities these are classed as “Operating Instructions”.

Once the above have been identified, measures need to be taken to ensure that the facility is operated within the bounds of the safety case. At BNFL U.K. sites the safety case requirements are presented in “Operational Clearance Certificates” for radiological hazards and “Criticality Clearance Certificates” for criticality hazards. These certificates provide operators, for a given system within the facility:

- Operating Rules and the hazard being protected against. A reference is given to the Operating Instruction that will ensure that the Operating Rule is complied with. Operating rules must be practicable, unambiguous and compliance with them must be clearly demonstrable.

- An outline of Operating Instructions and specific references to detailed plant instructions (typically termed as “Operators Instructions”) which are used on a day to day basis by operators on the facility.

- An outline of any procedural assumptions made in the safety case, which are again referenced to detailed plant instructions.

- A list of the safety mechanisms with references to proof test instructions that are used to test the functionality of the safety mechanism. (See generic design safety features for ITS SSC’s). The frequency of this testing is also defined and a reference is given to Maintenance Instructions.

- Identification of failure of safety mechanism. This gives a clear unambiguous definition to the operators what constitutes a failure of a safety mechanism

- Substitution arrangements are outlined which would be put in place in the event of failure to the safety mechanism. Measures are defined for actions to be taken if the substitution arrangements cannot be put in place. Again reference is given to operators instructions.

- Further references are given to any relevant emergency instructions. (Refer also to Emergency Preparedness Section)

An example of an Operational Clearance Certificate is available for inspection (THORP Head End & Chemical Separation Plant OCC B4.1/570/201).

These certificates are the key documents that relate all of the requirements of the plant safety case to operators and maintenance instructions.

<u>Note:</u> For BNFL U.K. facilities Safety Related Equipment is not listed in the Clearance Certificates. They are identified in the Plant Maintenance Schedule (See generic design safety features for ITS SSC’s). They are labeled and secured on plant and are identified as Safety Related Equipment when referred to in instructions.

<u>Operators/Maintenance Instructions</u>

As outlined above, requirements of the safety case are cascaded into instructions used by operators to both run and maintain the facility. Instructions that are required to comply with the safety case are clearly labeled on the front sheet to alert operators of its safety significance. Key points are also contained within the instruction, which clearly alerts operators to the hazard and again has a cross-reference to the clearance certificate.

Typically for such instructions, checksheets are used which are signed off to demonstrate compliance. These are known as compliance record sheets.

Maintenance and proof test instructions have clear labels to show operators that the system is a safety mechanism. As well as the documentation, all components of the safety mechanism are clearly labeled on plant and are secured to prevent any inadvertent change.

In this way it is clear to the operators both from the written instructions and from equipment labeled on plant, what is important to safety, why it is important and what the operator must do to comply with the safety case.

An example of a Sellafield Proof Test Instruction for a "safety Mechanism" is also available for inspection. It clearly shows the safety status of the equipment and why it is important to safety. It identifies all the components of the system and gives the operator clear and unambiguous instruction with clear success criteria for the testing (THORP Maintenance Work Order 141301).

Document Control

A document control system is used to manage the documents referred to above.

Arrangements for checking and approval are defined. For documents associated with the plant safety case, an appropriate management safety committee gives approval. Document front pages clearly show that they have been approved for issue.

Copies of documents are controlled and old versions are removed when superceded.

The plant safety case is reviewed on a regular basis to ensure that operational experience is fed back. Any changes to the safety case are controlled by a change procedure to ensure that the change is justifiable and that all necessary steps to ensure successful implementation are considered. (E.g. all associated document changes and training arrangements are identified.)

Records are kept on all maintenance activities (see generic design safety features for ITS SSC's), compliance record sheets, plant logs and any event reports to both demonstrate that the safety case is being complied with and to provide information for safety case reviews and to support any investigations.

Event Reporting

Arrangements will be put in place to report any event where safety has been compromised or for any near miss. This will include any breach of the plant safety case requirements. The system will define reporting arrangements and investigation requirements based on the severity of the event. This will meet regulatory requirements and ensure that the root causes are identified to prevent re-occurrence. Arrangements will be put in place to ensure investigation recommendations are acted upon and that feedback is passed to all relevant personnel. For BNFL U.K. plants this is supported by a proprietary computer data base system. ("Prosafe") which has been developed under license with the owner into a pro-active learning from experience system.

2.0.3.2.2. Organizational And Training Arrangements

An appropriate organization structure needs to be in place with personnel with the required skills and experience in identified positions. Training needs to be identified and delivered with competency assessed to demonstrate that the organization can achieve the requirements of managing the facility's ITS SSC equipment as well as meeting production requirements.

Key managerial and technical attributes required for a given position will be identified and personnel selected against these requirements.

For each position a training profile is identified and the required training will then be delivered. (Consideration is given to previous experience.) Mandatory safety training is also defined and delivered (This will include emergency training). This mandatory training will include some form of assessment to demonstrate understanding of the safety requirements of each position. For BNFL facilities in the U.K., personnel are classed as "Suitably Qualified and Experienced or SQEP" when they have been trained and authorized to carry out tasks, which might affect safety. Demonstration of suitably qalified and experienced personnel is a regulatory requirement.

Systems are put in place to monitor training delivery and every person is issued with a training logbook to demonstrate that they have achieved the required training for their position.

For positions where personnel have a direct managerial responsibility against the plant safety case, a formal procedure is followed to ensure that the jobholder understands the plant safety case relevant to their plant area and understands their responsibilities against the plant safety case. For BNFL U.K. facilities such a person is defined as a "Duly Authorized Person or DAP". All first line supervisors and managers for operating facilities covered by the license are required to be "Duly Authorized". The training required will be identified in a profile. It would typically cover:

- Process & Equipment
- Safety case and responsibilities
- Response to fault conditions
- Emergency preparedness
- Industrial Safety & Environmental Responsibilities
- Event Reporting
- QA arrangements
- Radiological Protection Responsibilities

Personnel are required to demonstrate their understanding against these areas, specifically against the responsibilities of their position. This could be by either interview or witnessed exercise. The interview preparation and testing process typically takes 6-9 months. The certification of "Duly Authorized Personnel" status is a regulatory record. The regulator can require BNFL to revoke certification.

For all types of training, refresher-training periods are defined. As mentioned above training needs to be identified and delivered when changes are made either to the facility or to changes in the safety case. Arrangements are put in place to monitor the effectiveness of training in order to make continual improvement.

Combination of People and Procedures

Put together, the cascaded procedure system, the management structure, the appointment of suitably qualified personnel who are trained and then assessed, ensures that the facility is operated and maintained within the bounds of the safety case at all times. It is also clearly demonstrable to show compliance at all times.

To illustrate the strength in depth of these arrangements an example is used of a failure of an ITS SSC item:

- Identification of failure is alarmed to the operator. The priority of this alarm will indicate that the item is important to safety.

- Through the operators training, he/she will understand the significance of the alarm and that they must refer to an instruction.

- The operator would refer to the response to alarm instruction, which will clearly show that the item is important to safety, why it is important to safety and what the required response is.

- The person of responsibility would be informed. (Typically the shift manager) Through training and assessment this person would understand the significance of the alarm.

- The requirements of the instruction for dealing with the failure would then be put in place. This would include identification of the substitution requirements.

- The manager will ensure that the suitably qualified person to carry out maintenance/investigation “Maintainer” is briefed on the requirements of the job and that the item is ITS SSC. The manager will ensure that an appropriate Safe System of Work is in place.

- The maintainer through his/her training will understand the generic requirements of working on ITS SSC equipment as well as being suitably qualified to maintain the specific equipment.

- He/she will use a maintenance instruction that clearly states that the item is ITS SSC. The item will be clearly identified as SSC on the plant.

- Any spares used will have been subject to a QA procedure to ensure they are fit to use. Any calibration or test equipment used is also maintained under a QA system to ensure that it will produce correct results.

- A functional test instruction (“Proof Test”) again will clearly identify the equipment as ITS SSC and will clearly show the criteria to demonstrate that the item meets its required safety function.

- The maintainer through training will understand the requirement to record maintenance on the maintenance management system.

- The item can then be formally handed back for operation. Finally, routine surveillance by operators will confirm satisfactory operation of the ITS SSC.

Further re-assurance that all aspects of the administrative measures are being followed and that they are effective is given by a management audit program which will cover the entire scope of the administrative measures outlined above.

2.0.3.3. Radioactive Contamination Area Classifications

To ensure that radioactive contamination does not spread from its source, plant operating areas are classified into radioactive contamination areas as shown in Table 2.0-5. Each area has its own ventilation system with an increasing pressure depression as the contamination risk increases. Personnel access into each area is controlled according to the contamination risk. This approach has been demonstrated to keep normal plant operating areas free from contamination.

Table 2.0-5. Radioactive Contamination Area Classifications.

Uncontrolled Area (C1)	This refers to administration/ change room areas where no radiological access controls are required.
Controlled Area (C2)	The barrier between C1 and C2 designates the start of radiological access control. Rules associated with controlled area working prevent eating, drinking and other activities which would give a risk of internal intake of contamination. The C2 area is intended to remain free from any contamination. Air monitors and routine surveys reassure that C2 areas are not contaminated or carrying contaminated items. Personnel exiting C2 areas have to pass through installed personnel monitoring machines to confirm that they are carrying no contamination. Air extract from the C2 ventilation system is monitored prior to discharge.
Contamination Area (C3)	These are areas that are known to be contaminated. These areas such as equipment rooms or entrances to higher contamination areas are segregated from C2 areas by a sub-change room. Working in a C3 area requires a further level of protective clothing. Typically coveralls, rubber boots and gloves are required. A full face respirator may be required for specific tasks. C3 personnel protective equipment will be removed and a personnel monitoring check will be carried out prior to crossing the barrier into C2 areas. The lack of area activity in air monitors and re-assurance monitoring confirm that contamination levels are kept below pre-set limits. Air extract from C3 ventilation system is filtered and monitored prior to discharge.
High Contamination Areas (C4/C5)	Areas where high levels of contamination are expected to be present. Such areas are cells or active maintenance areas. Personnel entry into these areas are tightly controlled and would normally be entered through a containment structure “tent” with its own filtered exhaust. Dress required for such areas would be typically high integrity plastic suit with hood and respirator. Undressing after working in such an area is done in a controlled manner to prevent the spread of contamination. Work in such areas is not intended to be routine. Air extract from C5 ventilation systems is filtered and monitored prior to discharge.

2.0.3.4. Radiation Area Classifications

The TWRS-P Facility is classified according to the expected radiation levels in various areas of the facility. The purpose is to ensure that processes which result in the highest expected radiation levels are identified and that appropriate controls are provided. This supports the following:

- Incorporation of adequate shielding in the facility design
- Efficiency in the design such that processes with the higher dose rates can be grouped together and utilize common cell shielding provisions
- Personnel flow paths utilize the lowest dose rate areas
- Provisions for required detectors, alarms, and interlocks are incorporated into the design

Facility processes are evaluated in relation to radioactive material source terms, component geometries and the spatial relationships between components. Areas are then classified as R1 through R5 using the data in Table 2.0-5.

Table 2.0-6. Radiation Area Classifications

Classification	Target Dose Equivalent Rate (mrem/hr) for Wide-Spread and Static Radiation Fields	Maximum Dose Equivalent Rate (mrem/hr) (see notes 2 and 3)
R1 Unrestricted Area	0.025	0.05
R2 Controlled Area	0.05	0.5
R3 Radiation Area (Average)	See Note 1 (25)	10
R4 Radiation Area (Maximum)	See Note 1 (25)	100
R5 High/Very High Radiation Area	See Note 1 (100)	No Specific Limit

Note 1: Occupational Doses, and therefore, selection of an appropriate dose rate criteria will be very sensitive to occupancy in R3, R4, and R5 areas. Hence, rather than set a specific dose rate target for any of the classifications, the appropriate value should be derived for each individual area by considering the respective contributions to the worker's annual doses and applying the ALARA principle. At early design stages, when insufficient information is available regarding worker occupancy, initial target radiation levels of 2.5 mrem/hr and 25 mrem/hr are to be used for the R3 and R4 classifications. However, these initial values should be reviewed and adjusted as appropriate, when sufficient occupancy data is available.

Note 2: These maximum dose equivalent rate limits are set based on the basis of whole body radiation fields. Higher dose equivalent rates may be accepted for transient radiation fields (e.g. source movements), and for localized radiation fields (e.g. beams) that are unlikely to produce whole body exposure, subject to an appropriate justification of the effect on annual dose and ALARA.

Note 3: Notwithstanding the above dose rate equivalent targets and maximums, all radiation levels shall be within prescribed limits and ALARA.

Areas that are expected to be 100 mrem/hr or greater are provided with appropriate controls for High Radiation Areas or Very High Radiation Areas as detailed in 10 CFR 835.502. These controls include area monitoring, supplemental dosimetry, and a device that functions automatically to prevent use or operation of the radiation source or field while individuals are in the area. Very high radiation controls include measures to prevent unauthorized or inadvertent access.

2.0.3.5. Emergency Preparedness

An essential aspect of operating a facility such as TWRS-P is to have effective emergency arrangements. The following are features that have been established at other BNFL facilities that will be put in place on the TWRS-P Project.

Potential emergency situations will be identified and emergency instructions will be prepared. This will cover generic situations such as fire, activity release, high radiation, and where appropriate, instructions will be prepared for potential fault situations associated with specific unit operations as determined by assessment of hazards.

A management structure will be put in place to handle emergency situations. Roles and responsibilities will be clearly defined for all personnel. Personnel will be trained against these responsibilities and appropriate refresher training will be defined. This applies both for personnel with specific emergency roles and for all other employees who will need to follow emergency instructions.

Appropriate facilities and equipment to support a response will be put in place to manage an emergency situation. These include:

- An incident control facility
- Communication equipment
- Personal protective equipment
- Monitoring equipment
- Containment equipment (e.g., temporary barriers to control reentry)
- Other equipment identified for specific situations.

On Sellafield facilities it has been common practice to place portable emergency equipment stores at strategic locations on plant. These stores would typically contain:

- Personal protective clothing
- Respirators
- Floor covering for barrier area to minimize spread of contamination
- Floor plans
- Basic tools
- Telephones
- Telephone and power extension cables
- PVC bags for waste
- Stationary
- Flip charts (for briefing re-entry teams)
- Temporary barrier for footwear change
- Portable activity in air monitor
- Breathing air aparatus to be used in conjunction with emergency services.

For TWRS-P arrangements will be made with local/national authorities and emergency services for handling of emergency situations. Arrangements will also need to be made for inter-action with the rest of the Hanford Site. Communication arrangements will be made to keep local population, media and workforce informed.

A program of emergency exercises will be put in place to test arrangements and demonstrate satisfactory response. Typically these exercises will range from small team exercises to large-scale demonstrations with outside interfaces.

All aspects of the emergency arrangements will be set out in a plan along with procedures to ensure that the plan is effectively implemented. It will be continuously reviewed to ensure it meets the best practice.

2.0.3.6. Decommissioning Planning

During the design of the TWRS-P facility, consideration will be given to decommissioning at the end of its useful life. A decommissioning plan will be prepared during the plant specification stage and will cover the following:

1. Design and Operational Records: QA systems will be established to keep records from all stages of the TWRS –P project. This includes the original design all the way through to plant operational history records detailing maintenance, modifications and significant events.

2. Inactive Building Structure: Consideration will be given to how the inactive building structure needs to be demolished and how it will affect the active parts of the buildings.

3. In Cell Materials of Construction: All in-cell materials of construction will be such that they can be decontaminated, typically with wash water/acid, and will have a smooth surface. The predominant use of stainless steel in cells and caves facilitates this. For operational dose control, as far as possible, complex equipment is kept out of active caves/cells in order to ease decommissioning operations. Consideration on how to remove large in cell items will be considered at the design stage.

4. Wash Facilities: Wash facilities will be provided in the design to allow decontamination of in cell equipment. The cell/caves will also be equipped with facilities to allow washing of the cell/cave cladding. These may well be the same facilities required for plant wash during normal operation. This includes both the wash supplies (typically acid or water), emptying ejectors and effluent systems.

5. Crane/Lifting Facilities: Lifting beams required for installation of in cell equipment will remain in cell and will thus be available for use in decommissioning. Cranes, power manipulators etc. used during operating lifetime of facility will also be available for use in decommissioning.

6. Building Services: The decommissioning plan will determine the correct order for removing items from service. Clearly, ventilation and effluent facilities will need to be maintained to support the decommissioning process.

7. Cell Access Arrangements: Cells have shielded wall plugs, which can be removed in a controlled manner to allow radioactive monitoring, or camera inspection which can be used to plan decommissioning activities minimizing dose uptake. Cell access may be required at the decommissioning stage, either through cell access shield doors for lower activity cells/caves or by removing shielding blocks and shield plates for cells/caves with higher radioactivity.

8. Waste Handling: Consideration will be given to waste management during the design stage. This includes waste minimization, re-use of equipment and identification of waste routes.

2.0.4. Format of Category 1 Information

Category 1 information is presented in ten major sections based on the ten SSC groupings described in Section 2.0.2.2. Several systems are identified within each of the ten groups. Each system in the first eight sections is presented in two formats: text and a table of attributes. The last two (Fire Protection and Other) include only tables of attributes.

These are all of the SSCs identified to date. At this point in the design, all these SSCs are considered to be likely to be classified as ITS. As the design matures, and additional hazards analyses are performed, some SSCs may be added to or dropped from the list.

The text includes summary discussions in the following areas:

- Purpose
- Description of the system and its operation
- Hazardous situations and faults

The table of attributes lists:

- Fault as an event within the facility
- The ITS SSCs preventing or mitigating the fault
- The safety function of each ITS SSC
- The candidate DSFs proposed to ensure the reliability and availability of the ITS SSC.